

**SYSTEM FOR AUTOMATICALLY LOCATING VISIBILITY ZONES****RELATED APPLICATIONS**

**[0001]** The present application is a Continuation of co-pending PCT Application No. PCT/ES02/00337, filed July 8, 2002 which in turn, claims priority from Spanish Application Serial No. 200101819, filed August 2, 2001. Applicants claim the benefits of 35 U.S.C. §120 as to the PCT application and priority under 35 U.S.C. §119 as to said Spanish application, and the entire disclosures of both applications are incorporated herein by reference in their entireties.

**Object of the Invention**

**[0002]** The automatic visibility zone locating system serves the purpose of providing objectivity, immediacy, personalization and precision for a task necessary for measuring the visibility of an element within an environment which may be that of a city, an airport, a station or anywhere that can be mapped.

**[0003]** Thanks to the computer application integrated into said system, the axes of the streets from which an advertising medium would be viewed are immediately available, taking into account the course in which the individuals are moving, the angle at which the shop window or advertising poster is situated, the height and size thereof, the necessary degree of legibility and the arc allowing the medium in question to be seen "frontally" for optimum legibility.

**[0004]** This computer application also takes into account the obstacles which may hinder visibility, the

shape of the block where the bill in question is located, the height of the different elements, the shape of the buildings in the surrounding zone, shielding problems... This application also takes into account the speed at which the individuals and the means of transport are moving in order to determine the lapses of time each is exposed to the same, as well as their viewing angle of the medium in question.

**[0005]** It is only necessary to create or mark a point, a line or a polygon representing the poster in question, its orientation and its size on the digital mapping; and the visibility zone locating system will automatically locate all the segments or axes of the streets where said point will be able to be read or seen, the course in which said axes will have to be traveled in order for the advertising poster to be visible frontally and/or optimally, the percentage of effective frontal and/or optimum visibility of the advertising medium, the space of the axis on which the actual frontal and/or optimum visibility occurs, ...

#### Background of the Invention

**[0006]** To date, determining from what points along a street it would be possible to view an advertising medium, a shop window or a signal had to be done manually. In countries where existed this need of determining the audience viewing an advertising medium (countries such as France, where an "affimetrie" study was conducted), a committee of persons was formed to decide, point by point, from what streets and from what positions a certain medium

could be viewed. This entails a major manual task workload in addition to the subjectivity-related problems involved. The lack of immediacy and precision in the results is yet another problem, as it takes a long time for the human teams to complete the assigning of axes to the streets for all of the advertising media in the country (shop windows, automatic cash points, branch banks, etc.) employing the same criteria. Nor can personalized analyses be made if some characteristics, such as day or night or the reading distance are changed.

**[0007]** Another additional drawback is that the visibility zones can be irregular in shape and depend upon many different parameters. Furthermore, no system has been implemented to date which functions automatically taking three dimensions into account.

#### Description of the Invention

**[0008]** The system for automatically locating visibility zones from which an element to be viewed is visible (denominated as effective visibility zones), is wherein it comprises at least a computer application with means to locate said potential and effective visibility zones by means of a set of visibility zone locating criteria comprising:

at least one item of data about an element to be viewed selected from location, morphology, orientation and combinations thereof, with which the potential visibility zone locating means automatically locate at least a potential visibility zone assigned to the element to be viewed, and

at least one visibility study region mapped and stored on a computer medium with which, as function of the said potential visibility zone, the effective visibility zone locating means automatically locate effective visibility zones selected from effective visibility areas, effective visibility axes and combinations thereof, from which the element to be viewed is visible.

**[0009]** The set of visibility zone locating criteria additionally can be provided with other visibility zone locating criteria selected from:  
legibility of the element to be viewed,  
movement of the element to be viewed,  
lighting of the element to be viewed,  
morphology of the visibility study region,  
at least one potential visibility distance assigned to the element to be viewed as function of its morphology,  
at least one potential visibility distance assigned to the element to be viewed,  
at least one potential visibility distance assigned to the element to be viewed as function of its size,  
at least one potential visibility distance assigned to the element to be viewed as function of at least one viewing time,  
at least one potential visibility distance assigned to the element to be viewed as function of at least one viewing date,  
percentage of visibility of the element to be viewed,  
at least one potential visibility angle assigned to the element to be viewed, selected from horizontal angles, vertical angles and combinations thereof,  
at least one potential visibility angle assigned to the

element to be viewed as function of at least one viewing time, said potential visibility angle being selected from horizontal angles, vertical angles and combinations thereof,

at least one potential visibility angle assigned to the element to be viewed as function of at least one viewing date, said potential visibility angle being selected from horizontal angles, vertical angles and combinations thereof,

at least one optimum potential visibility angle assigned to the element to be viewed, selected from horizontal angles, vertical angles and combinations thereof,

at least one optimum potential visibility angle assigned to the element to be viewed as function of at least one viewing time, said potential visibility angle being selected from horizontal angles, vertical angles and combinations thereof,

at least one optimum potential visibility angle assigned to the element to be viewed as function of at least one viewing date, said potential visibility angle being selected from horizontal angles, vertical angles and combinations thereof,

at least one optimum potential visibility distance assigned to the element to be viewed,

at least one optimum potential visibility distance assigned to the element to be viewed as function of its size,

at least one optimum potential visibility angle assigned to the element to be viewed as function of at least one viewing time,

at least one optimum potential visibility angle assigned to the element to be viewed as function of at least one

viewing date,  
at least one lapse of viewing time of the element to be viewed, selected from maximum viewing time, minimum viewing time and combinations thereof,  
at least one lapse of viewing time of the element to be viewed, as function of its morphology, said lapse of viewing time being selected from maximum viewing time, minimum viewing time and combinations thereof,  
at least one lapse of viewing time of the element to be viewed, as function of at least one viewing time, said lapse of viewing time being selected from maximum viewing time, minimum viewing time and combinations thereof,  
at least one lapse of viewing time of the element to be viewed, as function of at least one viewing date, said lapse of viewing time being selected from maximum viewing time, minimum viewing time and combinations thereof,  
at least one lapse of viewing time of the element to be viewed, as function of at least one means of transport which moves at least partially through the visibility study region, said lapse of viewing time being selected from maximum viewing time, minimum viewing time and combinations thereof,  
direction and course of at least one individual moving at least partially through the visibility study region,  
direction and course of at least one means of transport moving at least partially through the visibility study region,  
average moving speed of at least one means of transport which moves at least partially through the visibility study region,

degree of visibility from at least one means of transport which moves at least partially through the visibility study region,

estimate of the number of individuals present in a determined zone of the visibility study region per unit of time, as function of at least one of the following sub-criteria: location, time, date, direction and course of moving and combinations thereof,

estimate of the number of means of transport present in a determined zone of the visibility study region per unit of time as function of at least one of the following sub-criteria: location, time, date, direction and course of moving, capacity of the means of transport, degree of occupation of the means of transport and combinations thereof,

degree of interference with the visibility of the element to be viewed due to temporary interposition of other elements, and

combinations thereof.

**[0010]** The computer application is provided with means for configuring at least one visibility zone locating criterion, said means of configuration being selected from: manual configuration, default configuration, configuration by extrapolation from visibility study regions with a similar morphology, configuration by visibility optimization criteria and combinations thereof. As an alternative source to obtain at least one visibility zone locating criterion, the computer application can access to at least one database in which at least one visibility criterion of at least one geographical location is stored.

**[0011]** The zones of visibility that have been located, are shown in at least one format selected from: at least one computer file compatible with at least one computer application, at least one image of the visibility study region where the visibility zones located are shown highlighted, a list of the visibility zones located, at least one mapping layer with associated information and combinations thereof.

**[0012]** Also, the computer application comprises means for evaluating the degree of visibility of different visibility zones, as function of the degree of achievement of at least one of the criteria of locating visibility zones.

**[0013]** More specifically, the effective visibility zones can be defined by effective visibility axes from which the element to be viewed is visible; even they can be additionally defined by at least one characteristic selected from: a course of effective visibility which specifies the course in which the effective visibility axis has to be traveled in order to view the element to be viewed frontally and/or optimally, a frontal and/or optimum effective visibility space and combinations thereof.

**[0014]** More particularly, the visibility study region can comprise at least partially, by an urban environment where the effective visibility zones are defined by effective visibility axes, courses of frontal and/or optimum effective visibility and frontal and/or optimum

effective visibility spaces corresponding to urban streets.

**[0015]** The system for automatically locate visibility zones comprises a computer application provided with a module of "assignment of effective visibility axes, courses of effective visibility" provided with means of locating effective visibility axes, frontal and/or optimum effective visibility courses and frontal and/or optimum effective visibility spaces, that enable to view the element to be viewed, by means of at least one input parameter selected from: at least one potential visibility angle assigned to the element to be viewed, at least one optimum potential visibility angle assigned to the element to be viewed, at least one potential visibility distance assigned to the element to be viewed, at least one optimum potential visibility distance assigned to the element to be viewed, morphology of the visibility study region, morphology and orientation of the element to be viewed, course of movement of individual and means of transport, plans of the visibility study region, visibility zone location criteria and combinations thereof.

**[0016]** Within the module of "assignment of effective visibility axes" and comprising an integral part thereof, the computer application comprises:

at least one module of "collection of mapping information" provided with means for locating potential visibility zones comprising spaces selected from potential visibility cones, portions of potential visibility spheres, zones of potential visibility and combinations thereof; and for generating mapping layers of the

visibility study region contained by at least one potential visibility zone, by means of at least one input parameter selected from: morphology of the element to be viewed, morphology of the visibility study region, at least one potential visibility angle assigned to the element to be viewed, at least one optimum potential visibility angle assigned to the element to be viewed, at least one potential visibility distance assigned to the element to be viewed, at least one optimum potential visibility distance assigned to the element to be viewed, plans of the visibility study region, visibility zone locating criteria and combinations thereof; and

at least one module of "location of effective visibility axes and effective visibility courses", by means of at least one input parameter selected from: potential visibility zone and mapping layer generated by the module of "collection of mapping information", morphology and orientation of the element to be viewed, course of movement of the individuals and of the means of transport, visibility zone locating criteria and combinations thereof.

**[0017]** Within the module of "collection of mapping information" and comprising an integral part thereof, the computer application comprises:

at least one module of "location of potential visibility zones", by means of at least one input parameter selected from: morphology and orientation of the element to be viewed, at least one potential visibility angle assigned to the element to be viewed, at least one potential visibility distance assigned to the

element to be viewed, at least one optimum potential visibility angle assigned to the element to be viewed, at least one optimum potential visibility distance assigned to the element to be viewed and combinations thereof;

at least one module of "location of potential visibility axes on a background map" by means of at least one input parameter selected from: visibility study region plans, urban environment and combinations thereof; and at least one module of "generation of mapping layers", by means of at least one input parameter selected from: potential visibility zones located by the module of "location of potential visibility zones", potential visibility axes on a background map generated by the module of "location of potential visibility axes on a background map", and combinations thereof.

**[0018]** Within the module of "location of effective visibility axes and effective visibility courses" and comprising an integral part thereof, the computer application comprises:

at least one module of "location of effective visibility axes", by means of at least one input parameter selected from: potential visibility zone and mapping layer generated by the module of "collection of mapping information", morphology and orientation of the element to be viewed and combinations thereof; and

at least one module of "determination of the course of effective visibility", by means of at least one input parameter selected from: at least one effective visibility axis located by the module of "location of potential visibility axes", course of movement of

individuals and means of transport, morphology and orientation of the element to be viewed, visibility zone locating criteria and combinations thereof.

**Description of an Embodiment of the Invention**

**[0019]** The present invention may be implemented in different embodiments and has many different fields of application: the visibility study region may be any geographical point regardless of its dimensions (a population center, an airport terminal,...) and the element to be viewed may be any person or object intended to be located in a strategic zone or for which the degree of visibility of the location thereof (advertising medium, shop window, informative poster, ...) is intended to be evaluated.

**[0020]** Next, it is described the functioning way of one of the possible embodiments of the invention, said description not being limiting of other possible ways of functioning.

**[0021]** As input parameters, the system takes all of the information related to the visibility criteria for a certain advertising medium (point to be viewed) such as its location, orientation, dimensions, type of medium, ...

**[0022]** The system calculates the values of one or more visibility distances, the size of the area of influence (potential visibility cone),... specifically for said advertising medium.

**[0023]** Also as input parameters, the system takes all of the information related to the urban environment visibility criteria (visibility study region) mapped and stored on a computer medium or, if necessary, in absence of information, it extrapolates said information from a similar zone. Other possible input parameters may be comprised by parametrizable visibility optimization criteria (greater visibility, greater frontal visibility, longer viewing time, greater degree of viewing closeness, ...) Said information comprises: location, shape and height of the buildings, course in which the urban street are traveled, estimate of the number of people using these streets, ...

**[0024]** On said urban environment, the system plots the area of influence of the aforementioned advertising medium.

**[0025]** By means of computer processing, the systems makes a detailed analysis of the urban environment mapped and stored on a computer medium for determining whether there are zones preventing the advertising medium from being visible.

**[0026]** The system scans the entire area of influence (potential visibility cone) of the advertising medium, intersecting with all of the obstacles that prevent the visibility of said advertising medium (buildings, trees, party walls, ...).

**[0027]** The system generates at least one new silhouette (effective visibility zone and/or optimum effective

visibility zone) defined by the surface area scanned by the beams up to the point of intersecting with obstacle elements that hinder visibility or up to the point of maximum visibility distance for said advertising medium.

**[0028]** The system locates the urban streets falling within the visibility zone and which comprise the visibility axes.

**[0029]** The system makes a vectorial, angular or by coordinates analysis in order to calculate the angle defined by the direction of each urban street and by the orientation of the advertising medium (defined as function of the morphology of said advertising medium). Thus, the system calculates the course of travel for each street in order for the advertising medium to be visible frontally and/or optimally, as well as the frontal and/or optimum visibility space for each axis and the frontal and/or optimum percentage of visibility for said axes with respect to the advertising medium in question.

**[0030]** By means of images, listings, mapping layers or computer files compatible with other computer applications, the system shows the urban streets from which the advertising medium is visible, indicating the course of travel, space and percentage of frontal and/or optimum effective visibility to view the advertising medium can be seen.

**[0031]** Optionally, the information generated by the system can be stored in a database for later processing or crossed with other information including estimates about

the number of individuals subject to seeing said point and, thanks to said information, be able to calculate audiences and coverages.

**[0032]** The system also provides a display tool enabling to see how the different input parameters affect on the final result.

**[0033]** The process is repeated by the system for each visibility criterion which changes the different input parameters, such as the potential visibility distance or distances, the time, optimum legibility, etc.